Amendments to the Specification

The paragraph starting at page 2, line 27 and ending at page 3, line 17 has been amended as follows.

Fig. 2 is a schematic diagram of the print head of Fig. 1 as seen from a direction z. A plurality of ejection openings (also referred to as "nozzles") are arranged in columns by ink colors. Designated 201 are nozzles that are formed in the print head 102 at a density of D nozzles per inch (D dpi) and can eject 10 pl of yellow ink. Nozzles capable of ejecting 10 pl of ink are called "large nozzles" and dots formed by ink droplets ejected from the large nozzles are called "large dots." Denoted 202 are nozzles smaller in diameter than the large nozzles and capable of ejecting 5 pl of yellow ink. The nozzles that eject 5 pl of ink are called "small nozzles" and dots formed by ink droplets ejected from the small nozzles are called "small dots." Likewise, 203, 205 and 207 represent large nozzles for magenta, cyan and black inks, respectively, and 204, 206 and 208 represent small nozzles for magenta, cyan and black inks, respectively.

The paragraph starting at page 3, line 21 and ending at page 4, line 10 has been amended as follows.

Returning back to Fig. 1, designated 103 is a paper feed roller 103 which rotates in a direction of the shown arrow together with an auxiliary roller 104 to hold a print medium P between them and feed it in a y direction (sub-scan direction). Denoted

105 are a pair of paper supply rollers to supply a print medium. The paired paper supply rollers 105 rotate holding the print medium P in between, as with the rollers 103 and 104, but their rotating speed is set smaller than that of the paper feed roller 103 to ~~crease a~~ <u>create</u> tension in the print medium. Denoted 106 is a carriage which supports the four ink jet cartridges 101 and ~~scan~~ <u>scans</u> them as they eject ink. The carriage 106 is situated at a home position h indicated by a dashed line in the figure when no printing operation is performed or when the print head 102 is subjected to an ejection performance recovery operation by a suction device 107.

The paragraph starting at page 4, line 11 and ending at page 5, line 4 has been amended as follows.

The recovery operation includes a suction-based recovery operation. This operation sucks out and discharges viscous ink, bubbles in the print head liquid chamber and mixed inks by the suction device 107 installed in the ink jet printing apparatus. The suction-based recovery operation normally involves capping a face of the print head, i.e., nozzle-formed surface, with a cap and then creating a negative pressure in the cap by a pump means such as <u>a</u> tube pump ~~and~~ <u>or</u> piston pump. The negative pressure thus generated causes the ink in the print head liquid chamber to be sucked and discharged out of the print head through the print head nozzles. Immediately after the suction operation, however, the ink sucked out into the cap remains on the print head face and this residual ink may flow back into the print head. This reverse flow may result in the viscous ink

remaining in the liquid chamber 209 of the print head. When the print heads of multiple colors are capped with a single cap for recovery operation, this reverse flow causes color ink mixing.

The paragraph starting at page 5, line 10 and ending at line 19 has been amended as follows.

The amount of power supplied from a power source to drive the print head is set assuming a normal printing condition. So, if during the preliminary ejection operation all nozzles are activated simultaneously for ejection, the power consumption exceeds the amount of power supply. Thus, ~~not~~ all the nozzles cannot be driven at the same time and normally the nozzles of the print head are divided into some groups that undergo the preliminary ejection operation at different times.

The paragraph starting at page 6, line 10 and ending at line 12 has been amended as follows.

Figs. 3A to 3C schematically illustrate how the main droplet, satellites and stray mist are formed at the time of ink ejection.

The paragraph starting at page 17, line 27 and ending at page 18, line 3 has been amended as follows.

Fig. 5 is a flow chart showing a sequence of steps performed by the preliminary ejection operation. The control according to this chart is executed by the CPU 400, a control means shown in Fig. 4.

The paragraph starting at page 18, line 4 and ending at line 15 has been amended as follows.

First, the large nozzles each make 29,000 ejections at an ejection frequency of 10 kHz (step 501) to discharge viscous or mixed color ink from the liquid chamber 209 and liquid paths of the large-nozzles. Then, the small nozzles each make 2,000 ejections at an ejection frequency of 10 kHz to discharge viscous or mixed color ink from the liquid ~~path~~ paths of the ~~small-nozzle~~ small-nozzles (step 502). The volume of ink discharged by this preliminary ejection operation is 38.4 μl, the same volume as that of the conventional practice, which is enough to remove the viscous or mixed color ink.

The paragraph starting at page 18, line 16 and ending at page 19, line 3 has been amended as follows.

Additionally, the number of preliminary ejections from the small-nozzle is defined as a minimum number of preliminary ejections for discharging viscous or mixed color ink. More specifically, even if large ~~amount~~ amounts of inks are ejected from ~~large-nozzle~~ the large-nozzles, viscous or mixed color ink ~~can not~~ cannot be discharged from the

liquid ~~path~~ paths of the ~~small-nozzle~~ small-nozzles sufficiently, due to a specific structure of the liquid chamber, the liquid path and the like in the head. Therefore, a given number of preliminary ejections from ~~small-nozzle~~ the small-nozzles are required to discharge viscous or mixed color ink from the liquid ~~path~~ paths sufficiently. In this embodiment, if the number of preliminary ejections from ~~small-nozzle~~ the small-nozzles is far less than 2,000 ejections, the viscous or mixed color ink ~~is remained at~~ remains in the small-nozzle liquid ~~path~~ paths.

The paragraph starting at page 19, line 4 and ending at line 13 has been amended as follows.

However, the total number of preliminary ejections is only 31,000, of which 29,000 ejections are from every large nozzle and 2,000 from every small nozzle. Compared with the conventional 40,000 preliminary ejections, of the total of which 20,000 ejections are from each large nozzle and 20,000 from each small nozzle, this embodiment performs as much as 9,000 less ejections. The time taken by the preliminary ejection operation of this embodiment is 3.1 seconds, 0.9 second shorter than that of the conventional practice.

The paragraph starting at page 19, line 14 and ending at page 20, line 4 has been amended as follows.

Further, since the number of preliminary ejections from small nozzles, which are more likely to produce stray mist than the large nozzles, is reduced to ~~one tenth~~ one-tenth that of the conventional practice, the generation of stray mist can be minimized significantly compared with the conventional practice. This in turn can reduce image impairments due to stray mist, including deviations of ejection direction and color ink mixing, and also a staining of the ink jet printing apparatus caused by stray mist adhering to its interior. Further, since the viscous or mixed color ink ~~are~~ is already discharged sufficiently from the liquid chamber by the preliminary ejection operation of the large nozzles, the reduced number of preliminary ejections from small nozzles, ~~one tenth~~ one-tenth that of the conventional practice, is good enough to remove viscous or mixed color ink from only the liquid ~~path~~ paths of the ~~small-nozzle .~~ small-nozzles.

The paragraph starting at page 20, line 19 and ending at line 24 has been amended as follows.

A print head used in this embodiment is similar to that of Fig. 2 used in ~~the~~ Embodiment 1. The number of preliminary ejections following the suction-based recovery operation is set to 29,000 ejections from each large nozzle and 2,000 ejections from each small nozzle, as in Embodiment 1.

The paragraph starting at page 21, line 8 and ending at line 15 has been amended as follows.

Further, since the volume of stray mist increases as the ejection frequency increases, performing the small-nozzle preliminary ejections at a low frequency of 5 kHz rather than 10 kHz can reduce the amount of stray mist produced. That is, the stray mist can be ~~reduce~~ reduced in volume ~~than~~ as compared to that in Embodiment 1, which in turn reduces contamination of the interior of the ink jet printing apparatus caused by the stray mist.

The paragraph starting at page 22, line 14 and ending at line 22 has been amended as follows.

In ~~Embodiment~~ Embodiments 1 and 2, description has been made of a print head in which a large-nozzle column is arranged on one side of a liquid chamber and a small-nozzle column is arranged on the other side. In this embodiment, we will ~~explain about~~ describe a print head which has large nozzles and small nozzles arranged alternately and in which the two nozzle columns arranged on both sides of the liquid chamber are made up of large nozzles and small nozzles.

The paragraph starting at page 25, line 6 and ending at line 14 has been amended as follows.

The present invention has been described in detail with respect to preferred embodiments, and it will now be apparent from the foregoing to those skilled in the art that

changes and modifications may be made without departing from the invention in its broader ~~aspect~~ aspects, and it is the intention, therefore, ~~in~~ that the ~~apparent~~ appended claims ~~to~~ cover all such changes and modifications as fall within the true spirit of the invention.